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The Effect of Physician Delegation to Other Health Care Providers on the Quality of Care for Geriatric Conditions

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Abstract

OBJECTIVES—to examine the effects of delegation on quality of care that patients receive for three common geriatric conditions: dementia, falls, and incontinence.

DESIGN—pooled analysis of 8 the Assessing Care of Vulnerable Elders (ACOVE) projects from 1998 to 2010.

SETTING—15 ambulatory practice sites across the United States

PARTICIPANTS—4,776 patients age ≥ 65 years, of mixed demographic backgrounds who participated in ACOVE studies.

INTERVENTION—multivariate analysis of prior ACOVE observation and intervention studies was conducted, with in addition to two retrospectively defined variables: “intent to delegate” and “maximum delegation” for each ACOVE quality indicator (QI).

MEASUREMENTS—The primary outcome for the study was QI pass probability, by level of delegation, for 47 ACOVE quality indicators.

RESULTS—A total of 4,776 patients were evaluated, with 16,204 QIs included for analysis. Across all studies, QI pass probabilities were 0.36 for physician-performed tasks; 0.55 for nurse

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David B. Reuben: study concept and design, analysis and interpretation of data, and preparation of manuscript

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practitioner (NP), physician assistant (PA), and registered nurse (RN)-performed tasks; and 0.61 for medical assistant (MA), or licensed vocational nurse (LVN)-performed tasks. In multiply adjusted models, the independent pass-probability effect of delegation to NPs, PAs, or RNs was 1.37 (p = 0.055)

CONCLUSIONS—Delegation to non-physician providers is associated with higher quality of care for geriatric conditions in community practices and supports the value of interdisciplinary team management for common outpatient conditions among older adults.

Keywords

geriatrics; quality of health care; geriatric health services; personnel delegation

INTRODUCTION

The US healthcare system is in a period of unprecedented change driven by a rapidly aging population living with a greater burden of chronic conditions and broad consensus that the United States must optimize the value of care—that is "outcomes relative to costs."[1] Among older patients, the quality of care for outpatient management of common health issues in this population has been consistently shown to be inadequate.[2–5] This gap between recommended and actual care provides an opportunity to improve the value of health care for older adults.[6]

Efforts to improve quality of care begin by defining quality. The Assessing Care of Vulnerable Elders (ACOVE) project developed quality indicators (QIs) to evaluate the processes of care provided to older Americans.[7] The ACOVE QIs were derived by combining expert opinion with a systematic literature review for 22 common conditions, including: dementia and memory loss; urinary incontinence; and falls and dysmobility.[2,8] These QIs were updated and expanded to 26 conditions in 2007.[9] In conjunction with the development of these quality indicators, the ACOVE investigators also developed a model of outpatient clinical practice change, (the "ACOVE-2 Model") to improve outpatient care processes though a structured intervention involving: case finding; delegated clinical data collection; structured visit notes; physician and patient education; and linkage to community resources. Implementation of this model repeatedly demonstrated improved quality for geriatric conditions in primary care.[4,5,10–12]

A key component of the ACOVE-2 intervention was the delegation of care to non-physicians for tasks as varied as history taking, standing orders, problem-focused counseling, and referral to community-based organizations. To date, the independent relationship of this component to quality of care has not been determined. In this analysis, we pooled data from eight ACOVE studies to examine the effect of delegation on quality of care for three geriatric conditions: dementia, urinary incontinence, and falls.

METHODS

The ACOVE studies focused on whether patients receive recommended processes of care for up to 26 target conditions. Care processes were categorically defined as preventive,

diagnostic, treatment, or follow up, and were provided largely in primary care offices. (See prior ACOVE studies for a comprehensive list of conditions and quality indicators.)[9] Eligibility criteria for quality indicators were based on individual study patient enrollment and QI criteria (detailed in the appendix and methods of prior studies). For each ACOVE study, all relevant medical records were reviewed by specially trained nurses using reliable abstraction instruments to determine whether recommended care processes were received. If a care process was offered by a provider, the care process was scored as having been provided (and therefore the QI "passed")—even if the patient refused the care process.[8]

For this study, we evaluated a subset of three geriatric conditions that were common across previous studies: falls/fear of falling (12 QIs), cognitive impairment/dementia (19 QIs), and urinary incontinence (16 QIs). To allow use of data collected over many years, ACOVE-1, ACOVE-2, and ACOVE-3 quality indicators were reconciled to align changes reflecting updates in best practices (see appendix for ACOVE-3 quality indicators). All ACOVE studies were approved by the Institutional Review Boards at RAND, the University of California, Los Angeles, and, when appropriate, the Veterans Affairs Healthcare System and local sites. The studies from which the data were obtained for this analysis are as follows (Table 1):

- The ACOVE-1 study was an observational cohort study from a random sample of community-dwelling adults 65 years of age or older who were enrolled in two managed care organizations. Patients and quality indicators were identified by retrospective chart review during the study period.[2]
- The ACOVE-2 study explored the effects of a multi-component intervention on the quality of care for dementia, falls, and urinary incontinence in two large, multi-site practices using a quasi-experimental design.[13] ACOVE-2 enrolled patients age ≥ 75 years who screened positive for one of the target conditions.
- The ACOVE Prime study used a quasi-experimental design to investigate the effects of a multi-component intervention (modified version of the aforementioned ACOVE-2 intervention model) for the care of falls and urinary incontinence at 5 small and medium sized, community-based group practices nationwide.[11]
- The ACOVE Alzheimer's Disease study used a pre- and post-design to evaluate an intervention to improve dementia care using the ACOVE-2 model at two community-based practices. The intervention partnered with local Alzheimer's Association chapters to provide community-based support.[5]
- The ACOVE Evercare study investigated the effects on quality of care of nurse care management in addition to standard care for a multi-morbid geriatric population enrolled in a Medicare Advantage Special Needs Plan.[14]
- The ACOVE UCLA NP study used a quasi-experimental design to investigate the effects of nurse practitioner co-management of geriatric patients for depression, dementia, falls, heart failure, and UI in an academic geriatrics practice.[4]

- The ACOVE UniHealth study used a case-study design to investigate the effects of nurse practitioner co-management of dementia, depression, falls, and urinary incontinence in two community-based practices.[10]
- The Senior Health project was an observational evaluation of a population-based sample of Medicare beneficiaries in fee-for-service Medicare and a Medicare Advantage plan (unpublished data).

In standard clinical practice, most ACOVE QIs are completed by physicians. However many of these care processes, such as history taking or orthostatic vital signs, could be delegated to less highly trained providers. For the intervention groups in each study, each practice site determined whether and to whom a care process would be delegated. Using this "site-determined" approach, we classified tasks as being completed by: physicians; NPs, PAs, or RNs; and by LVNs or MAs. Based on this classification, every individual QI was classified by a site-specific "intent to delegate" based on the particular work-flow in that clinic. (The concept of "intent to delegate" can be thought as analogous to "intent to treat," but representing the intended care provider who should perform a task.

We then created a simple ordinal scoring system for this intent to delegate ("delegation score"). Scores were ordinal values between 1 and 3, with 1 representing tasks intended to be completed by physicians (no delegation); 2 for tasks intended to be performed by NPs, PAs, and RNs; and 3 if tasks were intended to be performed by LVNs and MAs. In short, the higher the delegation score, the less trained was the provider to whom the task was delegated. For example, a site where MAs asked patients about the basic history for a recent fall (ACOVE 3 QI: Fall 2) would receive a delegation score of 3; a clinic that relied on physicians to ask about the circumstances of a recent fall would receive a delegation score of 1. The level of delegation employed by a clinic/site was assigned for each ACOVE QI since delegation level at each clinic could be different for each QI (or differ within a clinic/site if the study had both interventions and control arms. All patients eligible for a particular QI at a particular site were then assigned the QI-specific intended delegation score for that site. QIs for which researchers were unable to determine a delegation score were assigned a default value of 1 as this represented the usual practice of physicians being responsible for performing all elements of care.

In fact, some QI tasks are easier to delegate than others. Thus, we were concerned that the ease delegating the QI might be a confounder, related both to whether the task was delegated and to the pass rate. To control for this possibility, we created an additional variable for each QI that assessed the ease of delegation. This covariate, "QI maximum delegation," is a 3-category variable (1–3), with a score of "3" indicating that at least one site in all the pooled ACOVE studies had a QI delegation score of 3 for that QI; a score of "2" indicating that at least one site had a QI delegation score of 2; and a "1" indicating that no site delegated this QI to non-physician staff. This variable represents the maximum real-world delegation the QI had in any ACOVE study.

Analysis

The primary aim for this study was to determine if delegation of care to non-physician office staff was associated with improved quality of care, as measured by the likelihood of passing

ACOVE QIs. We examined the relationship between a patient's likelihood of passing a QI and the clinic/site's delegation score for that QI. Our unit of analysis was QI at the level of a patient. We analyzed 16,204 QIs triggered by 4,776 patients.

To determine the independent effect of delegation on passing a QI, a multivariable, modified Poisson regression was used to examine the association of QI pass probability with clinic-and-QI-specific delegation. The dependent variable was QI pass/fail for a patient, and the primary predictor variable was the delegation score for that QI task at the clinic/site where the patient was seen. In this model we additionally controlled for: QI condition (dementia, falls, or urinary incontinence), intervention group (usual care or ACOVE intervention), and the clinical care domain of the QI (screening, diagnosis, or treatment). We used generalized estimating equations to account for correlations (clustering) in the QI pass/fail outcome for a given QI between patients from the same clinic/site.

Because a major component of the ACOVE intervention was the intentional delegation of clinical tasks to non-physician provider, we also assessed the independent correlations between QI delegation, ACOVE intervention, and QI maximum delegation using Spearman's rho test. To control for ease of delegation, we performed a sensitivity analysis, in which we added the QI maximum delegation variable as an additional covariate to the modified Poisson regression.

Statistical analysis was performed using SAS Version 9.2.

RESULTS

The eight studies conducted between 1998–2010 that are the basis of this pooled analysis included three observational cohorts, plus four intervention-only practices, plus eight clinic sites with both “usual care” and “ACOVE-2 intervention” practices. Thus overall across the eight studies, there were 11 “usual care” practices and 12 intervention practices (Table 2). No site was involved in more than one study.

The patients across the ACOVE studies were all older Americans (age ≥ 65 years), but were culturally and financially mixed. All were insured through Medicare (either fee-for-service or a Medicare Advantage plan). About two-thirds of patients were female with a mean age of approximately 80 years old. For studies that categorized ethnicity or race, 51–95% of patients were White non-Hispanic (Table 1). No practice cared for a veteran or indigent population. One practice was based at an academic health center. Two practices maintained relationships with academic institutions, with one loosely affiliated with a family medicine residency program and the other serving as a site for internal medicine residency and geriatric fellowship trainees. The practitioners at most sites were general Internists or Family Medicine physicians, with a few having pursued additional geriatric fellowship or post-residency training. Five studies involved sites with nurse practitioners and/or physician assistants.

Across all sites, 4,776 patients were eligible for at least one QI, with 2,911 patients in the pooled intervention group and 1,865 in the pooled control group. Patients at intervention sites were eligible for 8,180 QIs and patients at control sites were eligible for 8,024 QIs. Of

the 47 QIs studied, 37 (79%) involved tasks that at least one site delegated to a non-physician provider (level 2 or 3 delegation); this yielded 3,143 tasks that were delegated to an NP, PA, or RN, and 881 tasks there were delegated to a MA or LVN. There was high correlation between QI delegation and the ACOVE intervention ($r = 0.62$, $p < 0.0001$) and moderate correlation between QI delegation score and QI maximum delegation ($r = 0.26$, $p < 0.0001$).

Results from unadjusted analysis of QI pass probability and delegation demonstrated a strong association between QI pass rate and delegation. The QI pass probability for physician-performed tasks (delegation level 1) was 0.36, for NP- or PA- delegated tasks (delegation level 2) was 0.55, and for LVN- or MA- delegated tasks (delegation level 3) was 0.61. Relative to physician-performed tasks (delegation level 1), the probability ratio for delegation level 2 was 1.53; 95% confidence interval: 1.31 – 1.80, p<.0001), and for delegation level 3 was 1.69, 95% confidence interval: 1.39 – 2.05, p<.0001).

In the multivariable analyses (Table 2), the adjusted pass probability ratio for delegation level 2 compared to no delegation was 1.37 (95% CI: 0.99 – 1.89; p=0.055), and for delegation level 3 (compared to no delegation) was 1.06 (95% CI: 0.88 to 1.27; p=0.55). Among the covariates, the ACOVE intervention study groups were associated with a higher passing probability (pass probability ratio 1.73; p<0.0001) compared with the ACOVE care as usual study groups. Passing probability varied by QI condition, with fall QIs having a significantly higher passing probability than urinary incontinence (the reference group). However, there was no statistical difference in the passing probability for dementia QIs compared to urinary incontinence. Passing probability also varied by QI domain, with diagnosis QIs having significant lower passing probability, and screening-prevention QIs having a significantly higher probability of passing, compared with treatment QIs (the reference group).

In sensitivity analysis, which included QI maximum delegation as an additional covariate, QI delegation score was no longer associated with QI pass probability, but maximum delegation score was significantly associated with QI pass probability: the pass probability ratio for QI maximum delegation of 2 was 1.95 (95% CI 1.55 to 2.44; p<0.0001). Results for the other covariates were similar to the base-case analysis (Table 2). Intervention sites had significantly higher QI passing probability compared to the ACOVE care as usual sites (95% CI 1.39 to 1.86; p <0.0001). Fall QIs had higher passing probability than urine incontinence QIs (95% CI 1.11 to 1.4; p <0.01), as did screening-prevention QIs compared to treatment QIs (95% CI 1.26 to 1.97; p <0.0001).

DISCUSSION

In this pooled analysis of eight studies using ACOVE quality indicators, we found that delegation improved the quality of care provided for three common geriatric conditions. Moreover, the processes of care that were improved have been shown to correlate with better patient outcomes.[15,16] In addition, a secondary analysis examining the maximum delegatability (i.e., the lowest level of training that any ACOVE study site delegated the QI to), suggests that with more delegation, the quality might even be higher.

These findings build on an emerging literature about the potential benefits of delegated, team-based outpatient care. For example, a recent meta-analysis for common medical conditions demonstrate that for the management of hypertension, dyslipidemia, and diabetes mellitus, nurse-managed protocols result in small but significant improvements in secondary outcomes for patients including blood pressure control, cholesterol levels, and hemoglobin A1C measurements.[17] Similarly, both individual studies and meta-analyses suggest that nurse practitioners and physicians generally fare similarly with regards to their patient's health outcomes for some common conditions[18–20] and co-management of depression has resulted in better mental health outcomes, care utilization, and cost.[21–23]

Demonstrations of patient-centered medical homes (PCMH), another model for team-based care, have also shown modest improvements in care processes for preventive services in general medical populations, and among older adults with multi-morbid disease, positive effects on preserving functional status and mortality.[15,24,25,26]

These findings must be considered in the light of the study's limitations. First, the analyses included both observational and quasi-experimental studies. Second, there was high correlation between QI delegation and the ACOVE interventions, thus making the ascertainment of an independent effect of delegation more difficult. Moreover, delegation was only one element of a multi-component intervention, and the intervention itself had a large, independent, and statistically significant effect on the probability of passing QIs. Third, sites were classified by “intent to delegate,” not actual delegation at the level of individual patient. It is likely that some individual exceptions may have occurred in actual practice that differed from the intended delegation model. This may have resulted in some misclassification of actual delegation that would likely attenuate the effect size in our models. Finally, the number of quality indicators that were delegated to LVNs or MAs was small, limiting the power to detect differences between levels 2 and 3 of delegation. Finally, this study examined only three geriatric conditions. Effective delegation on quality of care for other conditions remains to be determined.

Interventions on the process of care, including delegation, represent unique opportunities to enhance the quality of care within existing health care infrastructures. The ACOVE-2 intervention encourages all team members to work at the highest level commensurate with their training, and services (tasks) to be delegated to the lowest level of professional training.[27] This model attempts to leave persons with greater training or responsibility free to perform tasks or solve problems for which they are uniquely qualified.

CONCLUSION

The delegation of specific processes for the management of urinary incontinence, dementia, and falls, to lower level providers is associated with higher quality care for these conditions. These findings suggest that both efficiency and quality can be improved through team care with increased delegation of care processes. Additional research should aim to identify which tasks can be delegated for other conditions and determine in best ways to implement delegation in practices of various sizes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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REFERENCES

1. Porter ME. What is value in health care? N Engl J Med. 2010; 363(26):2477–2481. doi:10.1056/NEJMp1011024. [PubMed: 21142528]
2. Wenger NS, Solomon DH, Roth CP, et al. The quality of medical care provided to vulnerable community-dwelling older patients. Ann Intern Med. 2003; 139(9):740–747. http://www.ncbi.nlm.nih.gov/pubmed/14597458. [PubMed: 14597458]
3. Brook RH, McGlynn E a, Shekelle PG. Defining and measuring quality of care: a perspective from US researchers. Int J Qual Health Care. 2000; 12(4):281–295. http://www.ncbi.nlm.nih.gov/pubmed/10985266. [PubMed: 10985266]
4. Ganz, D a; Koretz, BK.; Bail, JK., et al. Nurse practitioner comanagement for patients in an academic geriatric practice. Am J Manag Care. 2010; 16(12):e343–e355. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3652524&tool=pmcentrez&rendertype=abstract. [PubMed: 21291291]
5. Reuben DB, Roth CP, Frank JC, et al. Assessing care of vulnerable elders--Alzheimer's disease: a pilot study of a practice redesign intervention to improve the quality of dementia care. J Am Geriatr Soc. 2010; 58(2):324–329. doi:10.1111/j.1532-5415.2009.02678.x. [PubMed: 20374405]

6. Articles S. Patient-centered care for older adults with multiple chronic conditions: a stepwise approach from the American Geriatrics Society: American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity. J Am Geriatr Soc. 2012; 60(10):1957–1968. doi: 10.1111/j.1532-5415.2012.04187.x. [PubMed: 22994844]
7. Reuben DB, Roth C, Kamberg C, Wenger NS. Restructuring primary care practices to manage geriatric syndromes: the ACOVE-2 intervention. J Am Geriatr Soc. 2003; 51(12):1787–1793. http://www.ncbi.nlm.nih.gov/pubmed/14687359. [PubMed: 14687359]
8. Shekelle PG, MacLean CH, Morton SC, Wenger NS. Assessing care of vulnerable elders: Methods for developing quality indicators. Ann Intern Med. 2001; 135(8 Pt 2):647–652. doi: 10.7326/0003-4819-135-8_Part_2-200110161-00003. [PubMed: 11601947]
9. Wenger NS, Roth CP, Shekelle P, et al. Introduction to the Assessing Care of Vulnerable Elders-3 quality indicator measurement set. J Am Geriatr Soc. 2007; 55 doi:10.1111/j.1532-5415.2007.01328.x.
10. Reuben DB, Ganz DA, Roth CP, McCreath HE, Ramirez KD, Wenger NS. Effect of nurse practitioner comanagement on the care of geriatric conditions. J Am Geriatr Soc. 2013; 61:857–867. doi:10.1111/jgs.12268. [PubMed: 23772723]
11. Wenger NS, Roth CP, Hall WJ, et al. Practice redesign to improve care for falls and urinary incontinence: primary care intervention for older patients. Arch Intern Med. 2010; 170:1765–1772. doi:10.1001/archinternmed.2010.387. [PubMed: 20975026]
12. Roth CP, Ganz DA, Nickels L, Martin D, Beckman R, Wenger NS. Nurse Care Manager Contribution to Quality of Care in a Dual-Eligible Special Needs Plan. J Gerontol Nurs. 2012; 38:44–54. doi:10.3928/00989134-20120606-10. [PubMed: 22833891]
13. Wenger NS, Roth CP, Shekelle PG, et al. A practice-based intervention to improve primary care for falls, urinary incontinence, and dementia. J Am Geriatr Soc. 2009; 57(3):547–555. doi: 10.1111/j.1532-5415.2008.02128.x. [PubMed: 19175441]
14. Wenger NS, Roth CP, Martin D, et al. Quality of care provided in a special needs plan using a nurse care manager model. J Am Geriatr Soc. 2011; 59(10):1810–1822. doi:10.1111/j.1532-5415.2011.03599.x. [PubMed: 22091494]
15. Higashi T, Shekelle P, Adams J, et al. Quality of care is associated with survival in vulnerable older patients. Ann Intern. 2005; 143(4):274–281. http://annals.org/article.aspx?articleid=718690.
16. Min LC, Reuben DB, Adams J, et al. Does better quality of care for falls and urinary incontinence result in better participant-reported outcomes? J Am Geriatr Soc. 2011; 59:1435–1443. doi: 10.1111/j.1532-5415.2011.03517.x. [PubMed: 21806560]
17. Shaw RJ, McDuffie JR, Hendrix CC, et al. Effects of nurse-managed protocols in the outpatient management of adults with chronic conditions: a systematic review and meta-analysis. Ann Intern Med. 2014; 161(2):113–121. doi:10.7326/M13-2567. [PubMed: 25023250]
18. Mundinger MO, Kane RL, Lenz ER, et al. Primary Care Outcomes in Patients Treated by Nurse Practitioners or Physicians: A Randomized Trial. 2000:59–68.
19. Lenz ER, Mundinger MO, Kane RL, Hopkins SC, Lin SX. Primary care outcomes in patients treated by nurse practitioners or physicians: two-year follow-up. Med Care Res Rev. 2004; 61(3): 332–351. doi:10.1177/1077558704266821. [PubMed: 15358970]
20. Boult C, Reider L, Leff B, et al. The effect of guided care teams on the use of health services: results from a cluster-randomized controlled trial. Arch Intern Med. 2011; 171:460–466. doi:http://dx.doi.org/10.1001/archinternmed.2010.540. [PubMed: 21403043]
21. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. BMJ. 2006; 332(7536):259–263. doi:10.1136/bmj.38683.710255.BE. [PubMed: 16428253]
22. Unützer J, Katon WJ, Fan MY, et al. Long-term cost effects of collaborative care for late-life depression. Am J Manag Care. 2008; 14:95–100. doi:7019 [pii]. [PubMed: 18269305]
23. Unutzer J, Katon W, Callahan CM, et al. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. JAMA. 2002; 288(22):2836–2845. doi:joc21093 [pii]. [PubMed: 12472325]
24. Jackson GL, Powers BJ, Chatterjee R, et al. The Patient-Centered Medical Home. Ann Intern Med. 2013; 158(3):169. doi:10.7326/0003-4819-158-3-201302050-00579. [PubMed: 24779044]

25. Fishman, P a; Johnson, E a; Coleman, K., et al. Impact on seniors of the patient-centered medical home: evidence from a pilot study. Gerontologist. 2012; 52(5):703–711. doi:10.1093/geront/gnr158. [PubMed: 22421916]

26. Friedberg MW, Schneider EC, Rosenthal MB, Volpp KG, Werner RM. Association between participation in a multipayer medical home intervention and changes in quality, utilization, and costs of care. JAMA. 2014; 311(8):815–825. doi:10.1001/jama.2014.353. [PubMed: 24570245]

27. Grumbach K, Bodenheimer T. Can health care teams improve primary care practice? JAMA. 2004; 291(10):1246–1251. doi:10.1001/jama.291.10.1246. [PubMed: 15010447]

TABLE 1

Medical conditions, study, patients, and practitioner characteristics.

Study	Study Conditions				Enrolled Patients						Site and Quality Indictors			
	Study Year	Falls	Incontinence	Dementia	Intervention patients (n)	Control patients (n)	Total patients (N)	Female (%)	White non-Hispanic (%)	Patient Mean Age (yr)	Site	Site Intervention	QI delegation score (mean)	QI pass rate (%) (N passed/N eligible)
ACOVE1	1998	+	+	+	NA	372	372	64	NA	80.6	A	Control	1.00	0.29 (408/1369)
											B	Control	1.00	0.17 (76/439)
												Intervention	1.63	0.39 (212/531)
ACOVE2	2002	+	+	+	357	287	644	66	95	81	C	Control	1.00	0.31 (127/411)
												Intervention	1.00	0.39 (249/633)
Senior Health	2005	+	+	+	NA	290	290	53	93	82	D	Control	1.00	0.18 (249/1348)
											E	Intervention	1.00	0.40 (103/252)
AA Dementia	2007	NA	NA	+	121	0	121	NA	NA	NA	F	Intervention	1.15	0.47 (79/167)
											G	Control	1.00	0.24 (89/367)
												Intervention	1.00	0.59 (200/337)
											H	Control	1.00	0.31 (126/405)
												Intervention	1.00	0.51 (464/898)
ACOVE Prime	2007	+	+	NA	1772	1075	2847	71.7	NA	83	I	Control	1.00	0.33 (138/415)
												Intervention	1.42	0.56 (261/459)
											J	Control	1.00	0.35 (258/721)
												Intervention	1.53	0.55 (376/676)
											K	Control	1.00	0.45 (384/842)
												Intervention	1.63	0.67 (409/603)
Evercare	2007	+	+	+	200	31	231	67	51	76.5	L	Control	1.00	0.35 (475/1349)
UCLA NP	2007	+	+	+	139	136	275	67	NA	85	M	Control	1.00	0.27 (97/358)
												Intervention	1.97	0.50 (291/580)
UniHealth	2010	+	+	+	322	336	658	71	NA	83.4	N	Intervention	1.97	0.57 (894/1544)

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Study	Study Conditions				Enrolled Patients						Site and Quality Indictors			
	Study Year	Falls	Incontinence	Dementia	Intervention patients (n)	Control patients (n)	Total patients (N)	Female (%)	White non-Hispanic (%)	Patient Mean Age (yr)	Site	Site Intervention	QI delegation score (mean)	QI pass rate (%) (N passed/N eligible)
											O	Intervention	1.97	0.53 (801/1500)
ALL SITES		+	+	+	2911	1865	4776				ALL	Control	1.29	0.30 (2427/8024)
											ALL	Intervention	1.20	0.53 (4340/8180)

TABLE 2

Independent effect size and QI passing probability of: QI-level delegation, intervention, QI condition and QI domain, by modified Poisson analysis.

Parameter	Comparison Group	Adjusted Full Model				Sensitivity Analysis			
		Effect Size	95% CI		p-value	Effect Size	95% CI		p-value
Study Group	Intervention	1.73	1.48	2.02	<.0001	1.61	1.39	1.86	<.0001
QI Condition	Dementia	1.09	0.85	1.40	0.52	0.88	0.69	1.12	0.31
QI Condition	Falls	1.28	1.14	1.44	<.0001	1.25	1.11	1.40	0.0001
QI Domain	Diagnosis	0.85	0.74	0.98	0.03	0.90	0.78	1.03	0.14
QI Domain	Screening-Prevention	1.31	1.06	1.61	0.01	1.57	1.26	1.97	<.0001
QI Delegation Score	2	1.37	0.99	1.89	0.05	1.16	0.82	1.64	0.40
QI Delegation Score	3	1.06	0.88	1.27	0.55	1.12	0.90	1.39	0.30
QI Maximum Delegation Score	2	-	-	-	-	1.95	1.55	2.44	<.0001
QI Maximum Delegation Score	3	-	-	-	-	0.88	0.75	1.05	0.15

*In this multivariate analysis, each covariate is associated with an effect size, which is derived by taking the natural of the regression estimate. This effect size represents a passing probability ratio – analogous to an odds ratio – in other words, the "odds" of QI passing probability for a given parameter compared to its reference group. The adjusted full model includes the following parameters with reference group: site name: F, study group: control; QI condition: urinary incontinence; QI domain: treatment; QI delegation score: 1. The sensitivity analysis was also performed that includes an additional adjustment for QI maximum delegation score, with reference group: QI maximum delegation score: 1.